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(54) Combination chipper/shredder and vacuum apparatus for lawns and gardens.

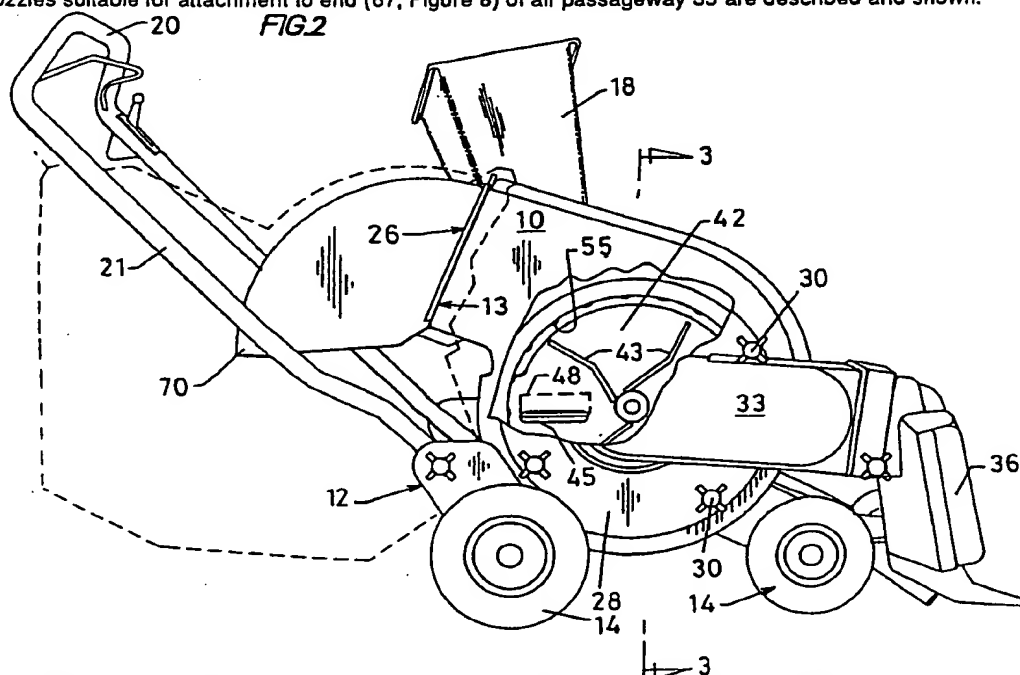
(57) The apparatus has a housing 10 and wheels 14 and a drive engine (16, Fig 1) for a plate-like disc 42 with four blades 43 on one face and with chipper blade(s) 48 on the other face cooperable with an anvil (or stationary blade) against which chipping of wood can take place.

Air is drawn by fan blades 43 through an inlet 33 and the top of the housing 10 has an outlet 13.

Inlet chute 18 forms part of housing 10 and a frame 12 supports a handlebar, structure 20 supporting a bag 24 to receive wood chips from the chipper and debris, grass clippings and leaves picked up into passageway 33.

Details of disc 42, (100, Figures 4, 5) and slots therein are given.

Nozzles suitable for attachment to end (67, Figure 8) of air passageway 33 are described and shown.



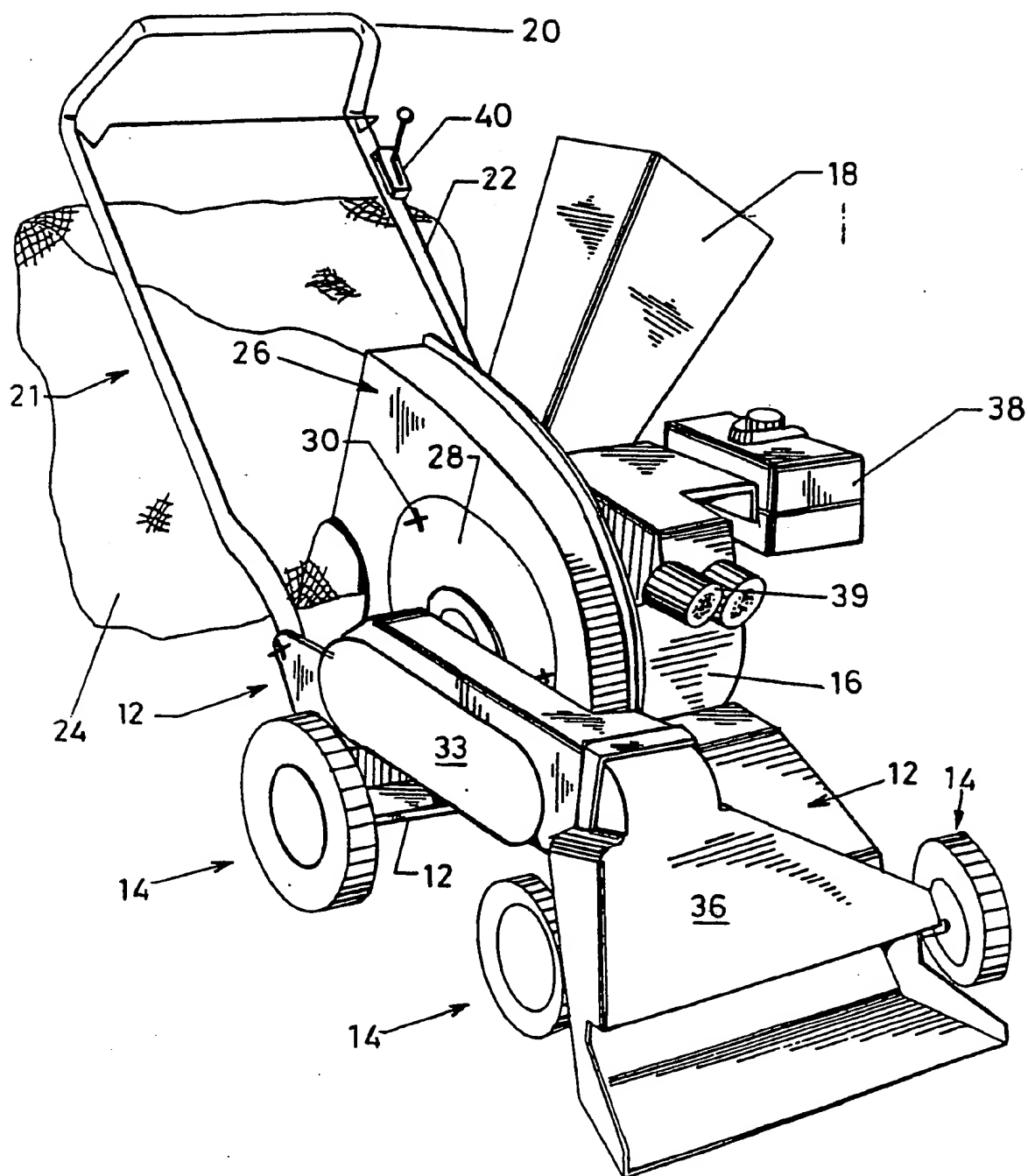
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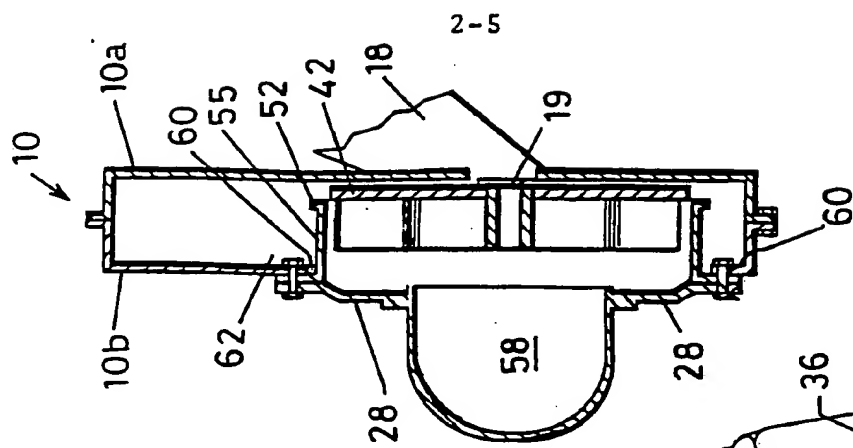
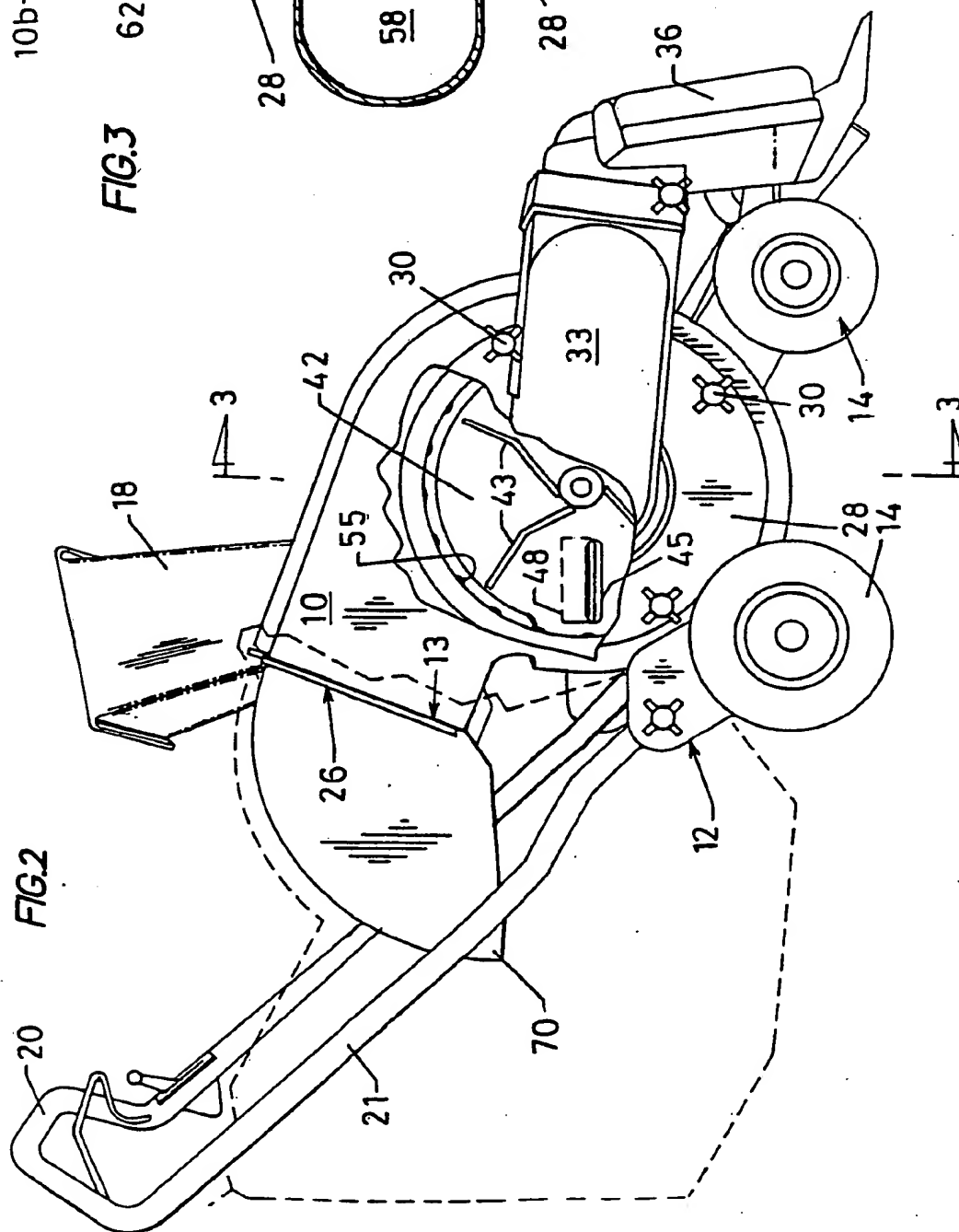
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20 10 92

1-5

FIG. 1





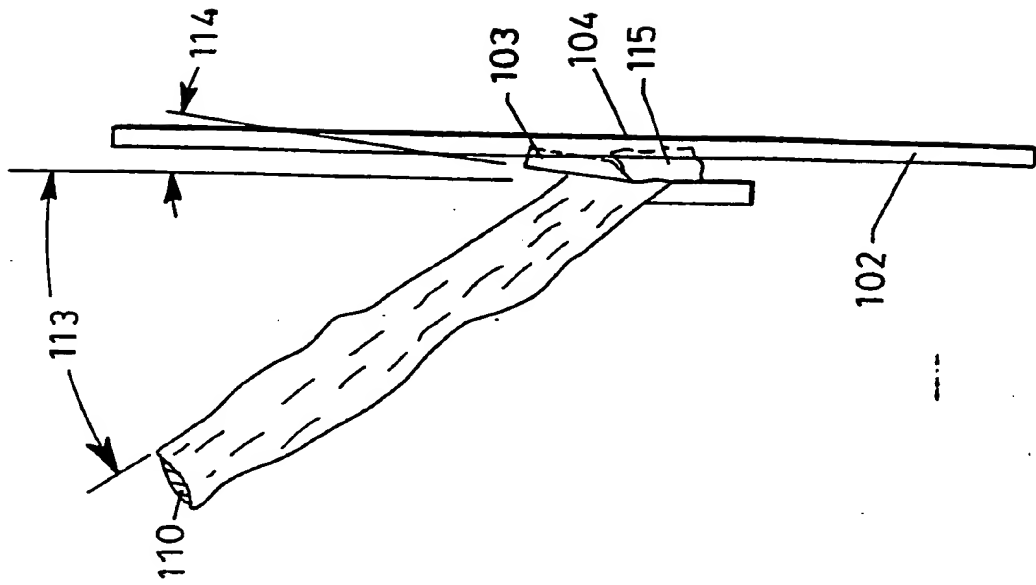


FIG. 5

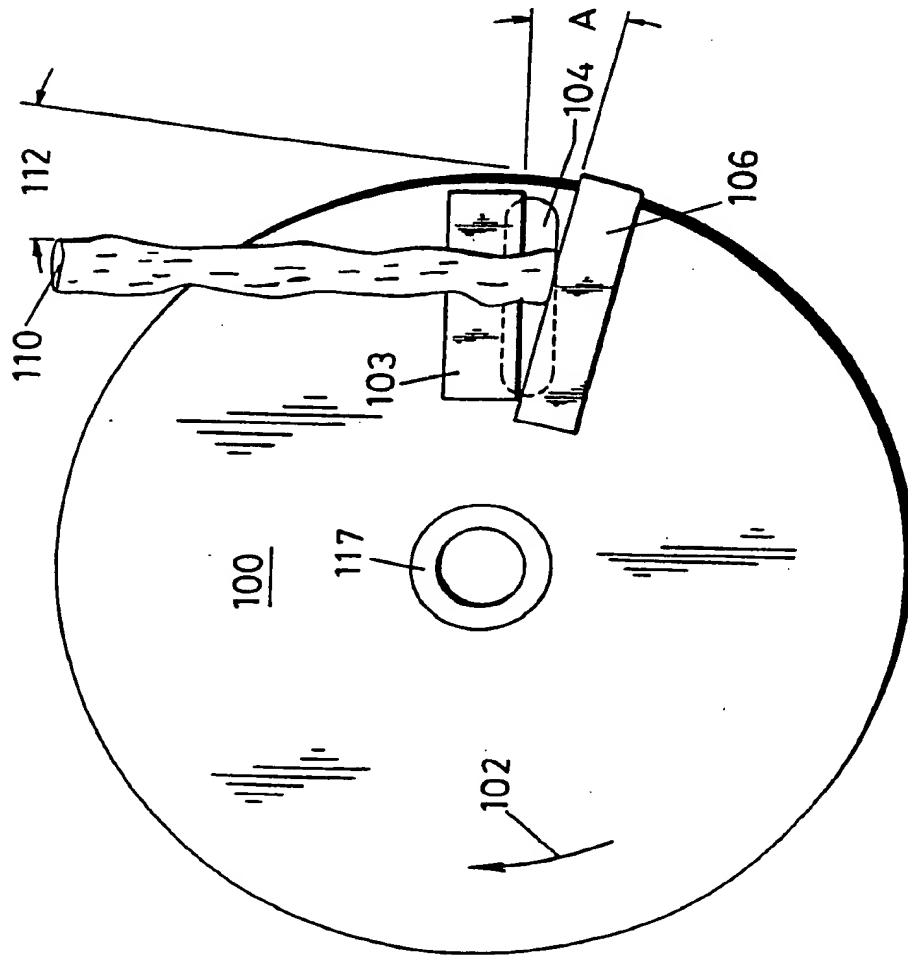
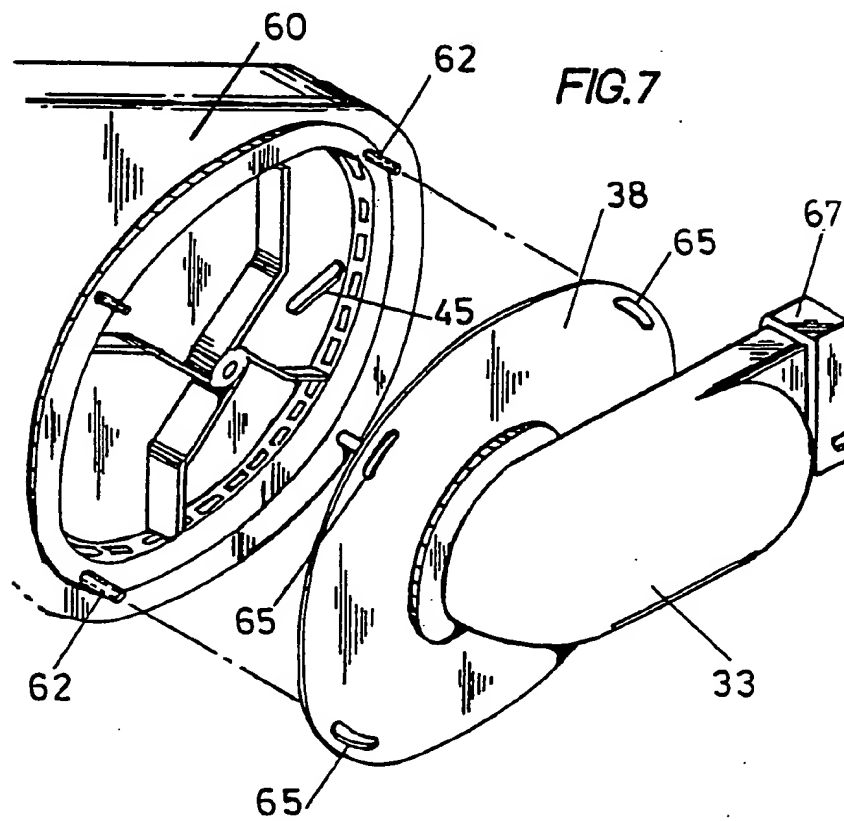
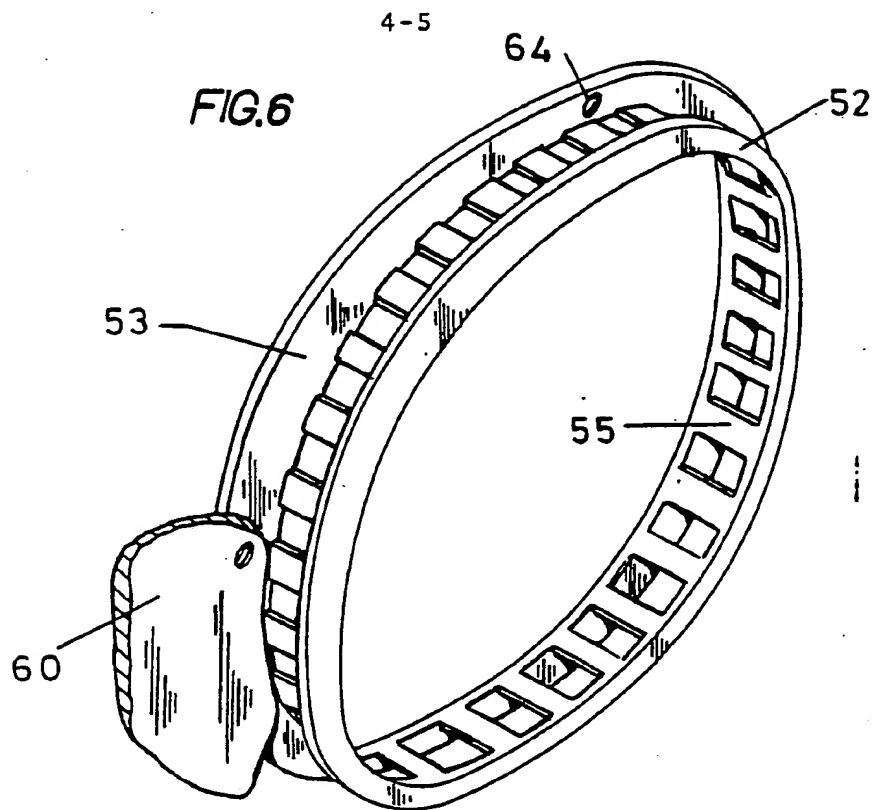


FIG. 4



COMBINATION CHIPPER/SHREDDER AND VACUUM
APPARATUS FOR LAWNS AND GARDENS

This invention relates to multi-purpose leaf, lawn and garden debris collection and disposal apparatus.

The disposal of lawn and garden debris for a homeowner has become a problem primarily because many areas of the United States of America and elsewhere are closing landfills and prohibiting the burning of refuse and debris, thereby complicating the disposal issue for the homeowner. Some communities have undertaken to collect leaves, grass clippings, branches, etc. in an effort to provide central disposal facilities but the cost of such central facilities and the cost of collection from the homeowner's property is becoming prohibitive. It is even expected that such debris as lawn clippings and leaves will not be collected because the centralized community facilities no longer can accept such debris. Over the years many devices have been created to deal with such debris problems leading to the development of vacuuming devices and pulverizing devices such as chippers and shredders. Combination devices which attempt to place on a single frame the apparatus necessary for turning limbs and branches into wood chips to be collected along with leaves, grass clippings, etc. have also been developed using a variety of structures.

It is a principal object of the invention to provide low cost, durable and easy to use apparatus for performing a wide variety of debris vacuuming chores while, at the same time, providing apparatus to perform limb and branch chipping as well as shredding functions.

It is also a principal object of this invention to provide apparatus for use by a homeowner which reduces the volume of leaves, grass, limbs, twigs and other debris to expedite composting, use in recycling or other disposal.

It is a still further object of the invention to provide combination chipping, shredding and vacuuming apparatus mounted on a single frame with a compact housing with fewer moving parts while being easy to move and store and which accommodates a single bag for all of the output debris.

An additional object is the construction of multi-purpose apparatus for lawn and garden chores such as chipping, shredding and vacuuming having a minimum number of replaceable parts to wear out and minimum structural complexity so as to permit facile use by a homeowner.

Other objects will be in part obvious and in part pointed out in more detail hereinafter.

According to a first aspect of the present invention there is provided mobile apparatus for vacuuming up and for chipping and/or shredding lawn and/or garden debris, which apparatus includes an inlet and an outlet and, located between the inlet and the outlet, a combination fan and cutter element to be driven in rotation, the arrangement being such that, in use, rotation of the element causes chipping and/or shredding of debris presented thereto, and generates an airflow to vacuum up debris at the inlet, to present vacuumed-up debris to the element and to move to the outlet debris chipped and/or shredded by the element.

According to a second aspect of the present invention there is provided apparatus for chipping, shredding and vacuuming lawn and garden debris comprising:

- a housing including a frame and support wheels permitting movement of the apparatus over a support surface;

- a motor mounted on said frame;

- a flat disc substantially enclosed within said housing and supported for rotation about a horizontal axis generally perpendicular to a nominal direction of apparatus movement when said apparatus is moved on said support wheels;

- said disc having a driving connection to said motor for disc rotation within said housing;

- a chipper blade mounted on a side of said disc facing said motor, said disc having an aperture extending therethrough adjacent said blade;

- a chipper inlet passageway forming a part of said housing in communication with said chipper blade at least once each disc revolution;

- an anvil supported on said housing in a position adjacent to said blade for cooperation with said blade upon each revolution of the disc to effect chipping of materials entering through said chipper inlet to exit through the disc aperture;

- a plurality of generally radially extending blades mounted on another side of said disc opposite said side of said disc facing said motor for rotation with said disc within said housing to thereby cause air movement with said housing;

- said housing having a central area on its side adjacent to said blades provided with an air inlet opening in a housing sidewall substantially coaxial with the disc rotational axis;

a cover for said air inlet opening partially defining an air passageway having an upstream air entrance end, said cover being removably fastened to said housing and having an aperture in the cover connected to said air passageway, said air passageway extending from said cover to said entrance end in a direction generally parallel to a major plane of said housing and a plane containing said disc to permit air to be drawn through said air passageway into said housing;

said housing having a peripheral wall and a top rear outlet, said wall forming a generally volute curve cooperating with the direction of rotation of said disc to cause air from said entrance end of said air passageway to be propelled by said blades axially into said housing and through said top rear outlet of said housing.

According to a third aspect of the present invention there is provided an apparatus for converting tree limbs and the like into small debris pieces comprising

a housing frame member having wheels thereon facilitating movement thereof;

a motor supported on said housing frame member;

a disc supported within said housing frame member for rotation about a horizontal axis, said disc being substantially enclosed by said housing frame member and connected to said motor for rotation thereby;

a chipper blade mounted on one side of said disc, said blade being mounted along a line parallel to a radius of said disc adjacent to an aperture in said disc substantially coextensive with said blade;

said blade being mounted at an angle to the surface of said disc thereby forming a rake angle and exposing a cutting edge for engaging a tree limb and the like;

an anvil mounted on the interior of said housing for cooperation with said blade, said anvil being mounted in circumferential alignment with said blade and along a radius of said disc to form an acute angle relative to the cutting edge of said blade so that a scissors cutting action takes place between the anvil and blade upon rotation of the disc;

a chipper inlet passageway formed in said housing, said passageway having an inlet opening greater than the outlet opening, a generally flat floor terminating adjacent to and aligned with said anvil, said floor of said passageway being upwardly inclined away from the plane of said disc to form an acute angle therewith

whereby brush, twigs and limbs engage said blade upon rotation of said disc, the angular relationship of the floor of the outlet opening causing self-feed chipping of the brush, twigs and limbs

and an outlet in said housing for distributing the chips so formed.

According to a fourth aspect of the present invention there is provided a walk-behind, wheel supported chipper, shredder vacuum apparatus comprising

a housing;

a disc enclosed by said housing;

a motor on said housing with driving connection to said disc to effect rotation thereof about a horizontal axis;

said disc having a chipper blade on one side and fan blades on the other and an aperture therethrough adjacent the chipper blade;

said housing having a chipper inlet facing the side of the disc with the chipper blade so as to effect chipping and shredding of tree limbs and debris inserted therein

said housing having an aperture formed therein coaxial with and facing said fan blades and an outlet aperture formed therein;

a generally cylindrical screen fixedly supported on said housing and of a diameter greater than said fan blades and smaller than the aperture in said housing so as to be insertable and removable through the aperture and to overlies said fan blades when inserted;

and passageway extending along said housing away from said outlet including a cover for the aperture in said housing and supported by said housing;

said passageway conducting air from its passageway inlet end together with debris entrained therein to the fan;

whereby the air and debris are propelled against said screen and through the outlet aperture.

According to a fifth aspect of the present invention there is provided apparatus for chipping, shredding and vacuuming lawn and garden debris comprising

a housing and a disc supported within said housing for rotation about a horizontal axis, said disc being the sole movable element to effect volume reduction of debris, chipping and air movement for vacuuming;

said disc having a chipper blade thereon and an aperture therein through said disc and coextensive with said blade;

a chipper inlet passageway forming a part of said housing in communication with said chipper blade at least once each revolution of said disc;

an aperture in said housing on the other side of said disc and blades mounted on said disc to effect air movement into the housing aperture;

a cylindrical screen of a diameter greater than said blades and mounted on said housing coaxial with said disc for engaging and effecting volume reduction of wood chips, leaves and other debris entrained in the moving air;

a single housing outlet for the entrained debris;

a generally tubular air inlet device including a cover for closing the air inlet opening in the housing;

said device extending generally parallel to said disc in a direction away from the outlet and having at least one attachment secured thereto for modifying the shape, size and location of the air inlet

A preferred embodiment of the multi-purpose apparatus of this invention has a single power-driven disc-like element to effect chipping of branches and related debris fed into a disc-mounted blade/aperture configuration on one side of the disc and a vacuum/volume reduction structure for the apparatus featuring fan blades disposed on the side of said disc opposite to the chipping blade, the fan being encompassed by a generally cylindrical screen located within a housing provided with an air inlet coaxial with the axis of rotation and adjacent to the fan blades whereby debris can be drawn in from the front end of an air passageway connected to the central aperture and discharged with the chips and debris through the screen out of a single outlet, the outlet being located at the top of a generally volute housing that encloses the disc. The apparatus can be mounted on wheels for walk-behind operation with handlebars supporting a debris collection bag whose inlet is attached to the outlet end of the housing the housing being arranged in a generally volute configuration to place the outlet at the top of the housing opposite to the front air inlet to which attachments can be affixed.

Embodiments of the apparatus will now be described, by way of example only, by reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an embodiment of the apparatus made in accordance with the present invention and showing certain principal features of the apparatus;

Figure 2 is a side view of the apparatus of Figure 1 with the bag removed for clarity of presentation and a portion of the outer housing broken away to show interior features;

Figure 3 is a cross-section of the apparatus of Figure 2 taken along the lines 3-3 of Figure 2 but without the housing broken away;

Figure 4 is a schematic side elevational view of a portion of the disc showing details of the chipping action of the present invention;

Figure 5 is a schematic cross-sectional view of Figure 4 taken generally adjacent to the twig showing the chipping action of the disc of Figure 4;

Figure 6 is a perspective view of the generally cylindrical screen of the invention;

Figure 7 is a partially exploded view illustrating the disc and screen installed in the housing aperture;

Figure 8 is a schematic illustration of one attachment that can be used with the invention;

Figure 9 is a schematic of another attachment that can be used with the invention; and

Figure 10 is a schematic illustration of a still further attachment that can be used with the invention.

Referring now to the drawings, and particularly to Figure 1 which shows a perspective view of a preferred embodiment of the apparatus of this invention, a housing generally designated 10, includes a frame 12 which supports and is supported by wheels 14, the frame 12 and housing 10 cooperating to support a drive engine 16. A generally rectangular chipper inlet chute 18 forms a part of the housing 10 and the housing 10 and frame 12 support a suitable handlebar structure 20, the parallel bars 21 and 22 of the handlebar structure 20 supporting a receptacle such as a bag 24 attached to the housing at 26. Housing 10 is provided with removable cover 28 secured by the fasteners 30 to the housing, cover 28 forming one end of air passageway 33 which extends from cover 28 forwardly and away from the bag 24 to engage a suitable accessory 36 which will be described in greater detail hereinafter.

For completeness, it is noted that the engine 16 is a typical petrol engine having a petrol tank 38, air inlet and exhaust elements 39 and a throttle control lever 40 for controlling the speed of that engine.

It is seen at Figure 2 that the partially cut-away portion of housing 10 reveals a plate-like disc 42 having fan blade elements 43 affixed thereto on one face thereof. The disc 42 has an aperture or slot 45 extending axially therethrough adjacent a chipper blade located on the other side of disc 42 as shown in dotted lines 48. (The disc 42 may be provided with more than said aperture or slot 45 and with a corresponding plurality of chipper blades 48.) (The or each aperture or slot 45 may extend to the periphery of disc 42.) Screen 50, best seen in Figures 6 and 7 is comprised of a pair of

circular rims 52 and 53 joined in spaced intervals along the full 360° by a plurality of cross bars 55. Rim 53 is of a larger diameter than rim 52 so as to provide a rim portion which overlies housing 10 and in particular the housing material adjacent to the air entrance aperture 58 formed by the sidewalls 60 surround the aperture 58 in housing 10. A plurality of fasteners 62 is secured to the sidewall 60 so as to mate with appropriate apertures 64 in rim 53 of screen 50 and to engage cover 28 as best seen in Figures 1 and 7. It should be noted that screen 50 overlies the end of blades 43. Cover 28 and air passage 33 can be formed as a single unitary moulding of a suitable plastics material with cover 28 being provided with slots 65 which mate with the aforementioned fastener 62 so that appropriate, easily removable fasteners can be provided to secure, in a simultaneous matter, the screen 50 and the cover 28 in position on housing 10. The slots 65 are provided to permit rotational adjustment of cover 28 to accommodate a variety of attachments that may be affixed to inlet end 67 as hereinafter described.

Referring particularly to Figures 1, 2 and 3, it is seen that the housing portion 10 is generally comprised of two generally cup-shaped sheet metal members, 10a and 10b fastened along their mating lines to define a closed chamber into which air is drawn by the fan blades 43 through inlet 33 and inlet end 67 (with attachments affixed thereto). Housing portion 10a supports chipper inlet 18 in a position where its open end 19 is aligned with chipper blade 48 (see Figures 4 and 5) with the bottom edge of chipper inlet 18 forming an anvil against which the chipping action takes place. (In other embodiments a stationary blade may be used instead of an anvil.) The wood chips pass through aperture 45 in the disc and into the chamber defined by cover 28 and housing 10 together with the screen 55 which extends for the full 360° of disc rotation. The outlet 13 defined at the top of housing 10 is shown in Figure 2 as having a deflector 70 secured thereto which deflector

serves to direct the chips and debris downwardly away from the operator standing behind handlebar 20 toward the ground; deflector 70 is substantially the same size as the upper outlet opening 13 of housing 10 and is secured thereto by any suitable means. With bag 24 in place, which bag is usually a fairly loosely woven but durable mesh, wood chips, debris, grass clippings and leaves, chipped and broken up by passage through screen 50 are deposited in the bag.

The nozzles suitable for attachment to end 67 of air passageway 33 are best seen in detail in Figures 8, 9 and 10, each nozzle attachment being secured in the illustrated embodiment by the engagement of upper lip 70 behind shoulder 71 thereby to pivot the attachment in downward direction so that captive fasteners 74 can engage the slots 76. Nozzle 80 has a generally trapezoidal configuration with front, back and side walls and a ramp 81 which defines a nozzle such that the air moving as indicated by the arrows 83 will carry leaves and entrained debris into the air inlet passageway 33. Figure 9 has the same type of fitting as shown in Figure 8 including an upper lip 70 and captive fastener 74 which cooperate with the appropriate slots whilst its shape 90 is substantially the same as that shown in Figure 8, a flexible lip 92 is provided rather than ramp 81 so as to constrain the air inlet flow and increase the accumulation of leaves, grass and the like. The attachment of Figure 8 can be used in conjunction with a rake if an individual wants to rake materials onto the ramp and both the attachments of Figure 8 and Figure 9 can be adjusted relative to the ground over which the apparatus moves on the wheels 14 by adjusting the position of the fastener 62 in the slot 65 of the cover member of the air passageway. Finally, there is shown in Figure 10 a hose attachment having a fitting 70 to be attached to inlet 67, which hose attachment can be used to clean hard-to-reach areas in places such as gardens and the like.

Turning now to Figures 4 and 5 and a special feature of this invention, a disc 100 is shown, which disc is similar to the disc 42 and is driven for rotation in the direction of arrow 102. A chipper blade 103 is fastened on one side of the disc substantially coextensive with the slot 104 formed in the disc and anvil 106 is shown schematically much as is provided in the apparatus of Figures 1 and 2. Twig 110 is shown in an angular position relative to disc 102, that angular position being limited in magnitude by the angle that exists between a suitable chipper inlet 18, (such as inlet 18 and particularly the floor 19 of the inlet 18). Angle A is defined as a clip angle which is the angle between the stationary anvil surface 106 and the rotating knife 103. The angle designated 112 is an angle between the hypothetical centre line of the branch 110 and a tangent line drawn to the disc. The angle of that limb relative to the plane of the disc is shown at 113 and, where appropriate, the rotating knife is mounted at a slight angle relative to the plane of the disc which angle is designated by the numeral 114 and a rake angle, figure 5 showing the blade 103 removing a chip 115. Because of the angular relationship that exists between the anvil (which is effectively fixed in position along a line generally coextensive with the radius of the disc) and the chipper blade which is position so that, rotation in the direction of the arrow 102 creates a clip angle which provides scissors action tending to force material towards the edge of the feed chute (anvil) all of the features above combine to make the apparatus self-feeding.

It will therefore be seen that the present invention provides a device performing the basic garden chores of rubbish, leaf and twig removal on an easily moved four wheeled platform which, if desired, can be made self-propelled with a suitable power takeoff from the motor. The operator can select the type of nozzle necessary for the work to be performed and if a vacuuming action is to be conducted on a substantially flat surface like a

lawn, the nozzle of Figure 9 can be used and adjustably positioned relative to the ground by slight rotation of the air passageway cover relative to the housing. In those circumstances where it may be desired to rake materials to the inlet opening, the attachment of figure 8 may be most desirable and in those situations where it is desired to remove leaves and other debris from gardens, the hose attachment can be put in position.

It is important to note that in the preferred embodiment there is only a single moving element and that in the preferred embodiment that moving element is a disc which is direct-connected at a suitable coupling 117 (see figures 3 and 4) to the drive shaft of the motor. However if desired, other connections can be used and a power takeoff can be provided if it be desired to convert the apparatus into a self-propelled unit.

Nonetheless, as the disc rotates, limbs and the like inserted into the chipper inlet are reduced to small chips which pass through the aperture in the disc into the other side of the disc where they are entrained in the air and thrust against the 360° screen. Similarly materials drawn through the inlet entrained in the air drawn in by the rotating fan are also taken into the inlet and thrust against the 360° screen such action serving to further reduce the size of the material thrust against the screen.

As best seen in Figure 2, with the disc rotating in a counterclockwise direction, the housing generally forms a volute curve with all debris passing through the screen being entrained in air and exiting through a single outlet located at the top of the housing. Because it is desired to direct the material downwardly when a bag is in position, a deflector is provided which deflector is attached to the single outlet opening to direct material downwardly into the loosely woven bag.

By reducing the number of moving parts, a device having a rugged long duty cycle has been provided and the need for maintenance on the apparatus itself is greatly reduced. Moreover, costs are kept low thereby bringing such a chipper/shredder vacuum cleaner apparatus within reach of many homeowners thereby materially assisting the control of the ever-increasing quantity of debris that must be disposed of by towns and in dumps and landfills.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosures can be made without departing from the teachings of this invention. All such modifications, adaptations and variations fall within the scope of this invention.

CLAIMS

1. Apparatus for chipping, shredding and vacuuming lawn and garden debris comprising:

a housing including a frame and support wheels permitting movement of the apparatus over a support surface;

a motor mounted on said frame;

a flat disc substantially enclosed within said housing and supported for rotation about a horizontal axis generally perpendicular to a nominal direction of apparatus movement when said apparatus is moved on said support wheels;

said disc having a driving connection to said motor for disc rotation within said housing;

a chipper blade mounted on a side of said disc facing said motor, said disc having an aperture extending therethrough adjacent said blade;

a chipper inlet passageway forming a part of said housing in communication with said chipper blade at least once each disc revolution;

an anvil supported on said housing in a position adjacent to said blade for cooperation with said blade upon each revolution of the disc to effect chipping of materials entering through said chipper inlet to exit through the disc aperture;

a plurality of generally radially extending blades mounted on another side of said disc opposite said side of said disc facing said motor for rotation with said disc within said housing to thereby cause air movement with said housing;

said housing having a central area on its side adjacent to said blades provided with an air inlet opening in a housing sidewall substantially coaxial with the disc rotational axis;

a cover for said air inlet opening partially defining an air passageway having an upstream air entrance end, said cover being removably fastened to said housing and having an aperture in the cover connected to said air passageway, said air passageway extending from said cover to said entrance end in a direction generally parallel to a major plane of said housing and a plane containing said disc to permit air to be drawn through said air passageway into said housing;

said housing having a peripheral wall and a top rear outlet, said wall forming a generally volute curve cooperating with the direction of rotation of said disc to cause air from said entrance end of said air passageway to be propelled by said blades axially into said housing and through said top rear outlet of said housing.

2. The apparatus of claim 1 wherein a generally cylindrical screen is supported on said housing in a position coaxial with said disc, the diameter of said cylindrical screen being greater than said blades so as to overlie the ends of said blades, said screen being interposed between said air inlet and said rear outlet.

3. The apparatus of claim 2 wherein said screen is further comprised of a pair of generally circular rims joined by a plurality of spaced bar members, one of the rims having an enlarged lip which is engageable with said housing adjacent its air inlet opening.

4. The apparatus of claim 3 wherein said removable cover for said air inlet opening overlies said enlarged lip of said screen, said screen and said cover overlying said air inlet opening in said sidewall of said housing, said cover and said screen being provided with spaced mating apertures through

which fasteners simultaneously fasten said cover and said screen to said housing.

5. The apparatus of claims 1 or 2 wherein said cover for said air inlet opening is provided with slots through which fasteners attach said cover to said housing thereby to permit limited rotational adjustment of the angular position of said cover and to vary the position of said entrance end of said air passageway relative to said support surface.

6. The apparatus of claim 1 wherein said entrance end of said air passageway receives at least one removable attachment for effectively varying the shape, size and location of said entrance end of the air passageway.

7. The apparatus of claim 1 wherein said top rear outlet of said housing wall is provided with a deflector to direct shredded materials in a generally downward direction.

8. The apparatus of claim 1 or claim 7 wherein handles are provided on said housing extending in a direction opposite said entrance end of said air passageway, and wherein a material debris collection bag is supported on said handles with a bag opening attached to said top rear outlet of said housing.

9. The apparatus of claim 1 wherein said housing frame member is provided with a chute on the side opposite to the inlet and forward of the handle, said chipper inlet passageway being located forward of the chipper outlet and at an acute angle to the vertical centre line of the housing so as to minimize interference with operator vision.

10. Apparatus for converting tree limbs and the like into small debris pieces comprising

- a housing frame member having wheels thereon facilitating movement thereof;

- a motor supported on said housing frame member;

- a disc supported within said housing frame member for rotation about a horizontal axis, said disc being substantially enclosed by said housing frame member and connected to said motor for rotation thereby;

- a chipper blade mounted on one side of said disc, said blade being mounted along a line parallel to a radius of said disc adjacent to an aperture in said disc substantially coextensive with said blade;

- said blade being mounted at an angle to the surface of said disc thereby forming a rake angle and exposing a cutting edge for engaging a tree limb and the like;

- an anvil mounted on the interior of said housing for cooperation with said blade, said anvil being mounted in circumferential alignment with said blade and along a radius of said disc to form an acute angle relative to the cutting edge of said blade so that a scissors cutting action takes place between the anvil and blade upon rotation of the disc;

- a chipper inlet passageway formed in said housing, said passageway having an inlet opening greater than the outlet opening, a generally flat floor terminating adjacent to and aligned with said anvil, said floor of said passageway being upwardly inclined away from the plane of said disc to form an acute angle therewith

- whereby brush, twigs and limbs engage said blade upon rotation of said disc, the angular relationship of the floor of the outlet opening causing self-feed chipping of the brush, twigs and limbs

- and an outlet in said housing for distributing the chips so formed.

11. The apparatus of claim 10 wherein said disc is provided with blades mounted on the side opposite said chipper inlet passageway for moving air towards said outlet.

12. The apparatus of claim 11 wherein a centrally disposed opening is provided in said housing and an air inlet passageway having an upstream end and a closure for the opening in said housing is provided.

13. The apparatus of claim 12 wherein the upstream end of the air passageway accommodates attachments to vary the configuration of the air inlet.

14. The apparatus of claim 13 wherein said housing frame member includes a top wall forming a generally volute curve cooperating with the direction of rotation of the disc and said outlet is located at the top rear of said housing frame member.

15. The apparatus of claim 14 wherein a debris and air deflector is attached adjacent said housing frame member outlet.

16. Walk-behind, wheel supported chipper, shredder vacuum apparatus comprising

a housing;

a disc enclosed by said housing;

a motor on said housing with driving connection to said disc to effect rotation thereof about a horizontal axis;

said disc having a chipper blade on one side and fan blades on the other and an aperture therethrough adjacent the chipper blade;

said housing having a chipper inlet facing the side of the disc with the chipper blade so as to effect chipping and shredding of tree limbs and debris inserted therein

said housing having an aperture formed therein coaxial with and facing said fan blades and an outlet aperture formed therein;

a generally cylindrical screen fixedly supported on said housing and of a diameter greater than said fan blades and smaller than the aperture in said housing so as to be insertable and removable through the aperture and to overlie said fan blades when inserted;

and passageway extending along said housing away from said outlet including a cover for the aperture in said housing and supported by said housing;

said passageway conducting air from its passageway inlet end together with debris entrained therein to the fan;

whereby the air and debris are propelled against said screen and through the outlet aperture.

17. The apparatus of claim 16 wherein said screen is comprised of a pair of generally circular rims joined by a plurality of spaced bar members, one of the rims having an enlarged lip engageable with the housing aperture and, wherein said cover and the enlarged lip on said screen are provided with mating apertures through which fasteners simultaneously fasten said cover and screen to said housing.

18. The apparatus of claim 17 wherein the passageway inlet end receives at least one removable attachment for effectively varying the shape, size and location of said passageway inlet.

19. The apparatus of claim 16 wherein handles are provided on said housing extending in a direction opposite to the passageway inlet, said handles being intended to be grasped by the operator for guiding the apparatus, said handles further supporting a collection bag therebetween, said bag having an opening attached to the housing outlet, the apparatus being supported on the wheels for movement in a nominal direction generally perpendicular to the axis of disc rotation.

20. Apparatus for chipping, shredding and vacuuming lawn and garden debris comprising

- a housing and a disc supported within said housing for rotation about a horizontal axis, said disc being the sole movable element to effect volume reduction of debris, chipping and air movement for vacuuming;

- said disc having a chipper blade thereon and an aperture therein through said disc and coextensive with said blade;

- a chipper inlet passageway forming a part of said housing in communication with said chipper blade at least once each revolution of said disc;

- an aperture in said housing on the other side of said disc and blades mounted on said disc to effect air movement into the housing aperture;

- a cylindrical screen of a diameter greater than said blades and mounted on said housing coaxial with said disc for engaging and effecting volume reduction of wood chips, leaves and other debris entrained in the moving air;

- a single housing outlet for the entrained debris;

- a generally tubular air inlet device including a cover for closing the air inlet opening in the housing;

said device extending generally parallel to said disc in a direction away from the outlet and having at least one attachment secured thereto for modifying the shape, size and location of the air inlet

21. The apparatus of claim 20 wherein said housing includes a top wall forming a generally volute curve cooperating with the direction of rotation of said disc and said outlet is located at the top rear of said housing.

22. The apparatus of claim 20 wherein said generally cylindrical screen is provided with an enlarged rim for engagement with the sidewalls of the air inlet aperture in said housing and the cover overlies said rims so as to be secured to the housing by the same fasteners.

23. Mobile apparatus for vacuuming up and for chipping and/or shredding lawn and/or garden debris, which apparatus includes an inlet and an outlet and, located between the inlet and the outlet, a combination fan and cutter element to be driven in rotation, the arrangement being such that, in use, rotation of the element causes chipping and/or shredding of debris presented thereto, and generates an airflow to vacuum up debris at the inlet, to present vacuumed-up debris to the element and to move to the outlet debris chipped and/or shredded by the element.

24. Apparatus according to claim 23, wherein the element is arranged to rotate about a generally horizontal axis.

25. Apparatus according to claims 23 or 24, wherein at least one aperture or recess in the element cooperates with a stationary blade or anvil to chip and/or shred debris presented thereto.

26. Apparatus according to claim 25 wherein a blade is mounted on the element adjacent the or each said aperture or recess.

27. Apparatus for chipping/shredding and vacuuming lawns and garden debris, substantially as hereinbefore described, with reference to Figures 1 to 7 of the accompanying drawings.

28. Apparatus as claimed in claim 27 as modified by reference to Figure 8 of the accompanying drawings.

29. Apparatus as claimed in claim 27, as modified by reference to Figure 9 of the accompanying drawings.

30. Apparatus as claimed in claim 27, as modified by reference to Figure 10 of the accompanying drawings.

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(ii) Int Cl (Edition 5) B02C

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

Search Examiner

J M WORVELL

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17 DECEMBER 1992

Documents considered relevant following a search in respect of claims 1 TO 9

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|------------------------|--|-------------------------|
| | NONE | |

| Category | Identity of document and relevant passages | Relevant to claim(s). |
|----------|--|-----------------------|
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Categories of documents

X: Document indicating lack of novelty or of inventive step.

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